PRODUCT

The Hoppe Electronic Inclinometer is capable of measuring the actual heel angle and determining the amplitude of the rolling oscillation of the ship over a range of ± 90°. Furthermore it is capable of measuring the time between the maximum values of the rolling oscillation and determining the roll period over a specific range. It provides all data with sufficient accuracy for a proper assessment of the ship’s dynamic situation.

TECHNICAL FEATURES

- Supporting the decision-making process on board in order to avoid dangerous situations.
- Assisting in and facilitating maritime casualty investigations by providing information about the roll period and the heel angle of the ship.
- Determination of actual heel and pitch angle of the ship.
- Determination of roll amplitude, as well as roll and pitch period of the ship.
- Presentation of all relevant information on a single display.
- Indication of active warnings.
- Peak value reset function.
- Alarm management in accordance with IEC 61924-2.
- Observation of safety relevant parameters.
- Interfaces to VDR (Heel/Roll-Measurement via NMEA telegram $--HRM).
- Open RS485 with motion data to automation.
- Display Dimming Control (DDC) via NMEA telegrams.

SIGNALS

- Actual heel angle, list angle, pitch angle and trim angle
- Max. amplitude PORT
- Roll period and pitch period
- GM est.
- Roll acceleration
- Peak to peak angle
- Max. amplitude STBD
- Max. peak to peak
- Period ratio
- Comfort level
## MEASUREMENT SPECIFICATIONS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>RANGE</th>
<th>TYPICAL ACCURACY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roll angle</td>
<td>± 90°</td>
<td>0.11° RMS$^{2\sigma}$ or 5% of reading</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(whichever is greater)</td>
</tr>
<tr>
<td>Pitch angle</td>
<td>± 45°</td>
<td>0.11° RMS$^{2\sigma}$ or 5% of reading</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(whichever is greater)</td>
</tr>
<tr>
<td>List/Trim angle (5 min. average)</td>
<td>± 45°/± 90°</td>
<td>0.09° RMS$^{2\sigma}$ or 5% of reading</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(whichever is greater)</td>
</tr>
<tr>
<td>Roll period</td>
<td>4 – 40 sec.</td>
<td>0.1 sec. RMS$^{2\sigma}$</td>
</tr>
<tr>
<td>Pitch period</td>
<td>4 – 40 sec.</td>
<td>0.1 sec. RMS$^{2\sigma}$</td>
</tr>
<tr>
<td>Angular acceleration</td>
<td>± 50°/sec.$^2$</td>
<td>1°/sec.$^2$ RMS$^{2\sigma}$</td>
</tr>
</tbody>
</table>

1) Approx. 95% of all measurement results will be in between the bound.

2) When subjected to two hours of continuous inharmonic wave motion in severe weather conditions with max. 10° amplitude with the device mounted 9m away from the roll center at reference conditions according to DIN 43751-1:1987, $T_{ref.} = +20°C$.

## MEASUREMENT CONDITIONS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>-15°C to +70°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20°C to +85°C</td>
</tr>
<tr>
<td>Reference temperature</td>
<td>+20°C</td>
</tr>
<tr>
<td>Linear temperature influence (angles)</td>
<td>±0.02°C/C</td>
</tr>
<tr>
<td>Temperature hysteresis (angles)</td>
<td>0.15° over full operating temperature range</td>
</tr>
<tr>
<td>Relative humidity (when housing open)</td>
<td>10 % to 85 %, not condensing</td>
</tr>
</tbody>
</table>

## ORIENTATION
**ELECTRICAL SPECIFICATIONS**

**Interface types & transfer rates**
- 1x RS 422 (Baud 4800, no parity, 8 data bits, 1 stop bit)
- 2x RS 485 (Baud 4800/38400, no parity, 8 data bits, 1 stop bit)
- 1x Ethernet 100 Mbit, Auto-MDIX
- 1x Universal Serial Bus (USB, max. 50mA)

**Protocol**
NMEA, HTTP, UDP (optional)

**Power supply (S-Line or UPS)**
- 24 VDC (+30% / -25% = 18 V – 31.2 V), max. 36 VDC input voltage
- 48 VDC with Power over Ethernet (IEEE 802.3)
- 800 mA miniature fuse, time-lag, 5x20 mm

**Digital Inputs**
- DI-#1 Warning acknowledged, DI-#2 Mute order
  - max. 24 VDC, ON-voltage 12V, OFF-voltage 8V;

**Relay Outputs**
- K-1 Warning active, K-2 Mute active
  - potential-free contacts
  - max. 1A at max. 30VDC or max. 0.3A at max. 125 VAC

**Power consumption**
- 12 W

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**COMMUNICATIONS**

**BAMS Serial Data Interface**
(RS 422)
- IEC 61162, IEC 61924-2 4800 Baud
- Output sentences: $--ALC; $--ALF
- Input sentences: $--HBT; $--ACN; $--TXT

**VDR Serial Data Interface**
(RS 485-1)
- IEC 61162-1,-2
- Output sentences: $--HRM; 38400 Baud

**Global Dimming Interface**
(RS 485-2)
- IEC 61162-1
- Input/Output sentences: $--DDC; 4800 Baud

**Alert State Transition Diagram**
acc. IEC 61924-2
## GENERAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutout-Dimensions &amp; Weight</td>
<td>159x159 mm; 65 mm minimum space behind cutout, 0.85 kg</td>
</tr>
<tr>
<td>Computer data</td>
<td>Processor: ARM Cortex A9 Dual Core, 800 MHz, 32 bit; 1GB RAM; Root file system: FLASH 4 GB;</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP44, for bridge installation (protected area);</td>
</tr>
<tr>
<td>Rules &amp; Regulations</td>
<td>General Performance Standard ISO 19697:2014; Performance Standards Resolution MSC.191(79); Performance Standards Resolution MSC 363(92); IEC 61162:2010; IEC 60945:2002; BSH Display Standard; Bridge Alert Management; Alert State Diagram; NMEA Sentences Requirements</td>
</tr>
</tbody>
</table>

## DIMENSIONS

![Dimension Diagram](image)

### CERTIFIED PRODUCT

![Certification Logos]

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Technical Documentation
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4/4

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